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NASA TECH BRIEF

Manned Spacecraft Center

Electronic Device Increases Threshold Sensitivity and Removes Noise from FM Communications Receiver

The problem:

One factor substantially affecting the performance of a frequency-modulation communication system signal is the operation of the demodulator in the receiver. As the received signal becomes weaker, a threshold point is reached below which the demodulator begins to introduce high-amplitude electrical noise — "click" noise — at a greater rate. In addition, the form of the "click" noise is of a much noticeable and objectionable nature.

The solution:

A threshold extension device connected between the output of the demodulator and the output filter minimizes "click" noise. The device consists of a click-eliminating signal transfer channel with a follow-and-hold circuit and a detector for sensing the click impulses. A gated output from an amplifier switches the follow-and-hold circuit to the hold condition, whereby the signal to the output filter is held at the last previous non-click value during the occurrence of the click impulse.

How it's done:

The FM demodulator output, consisting of the signal and the noise, is split into two separate channels (see Figure 1). The first channel (A) is fed to a series of impulse noise detection circuits which detect the presence of high-amplitude impulse noise — the primary contributor to the degraded performance of the FM system. Channel B (identical to channel A except for a preset time delay) is applied to the gated amplifier. The positive gating pulses from the noise detection circuits turn off channel B whenever a noise impulse occurs. This electronic action creates a "hole" in the channel

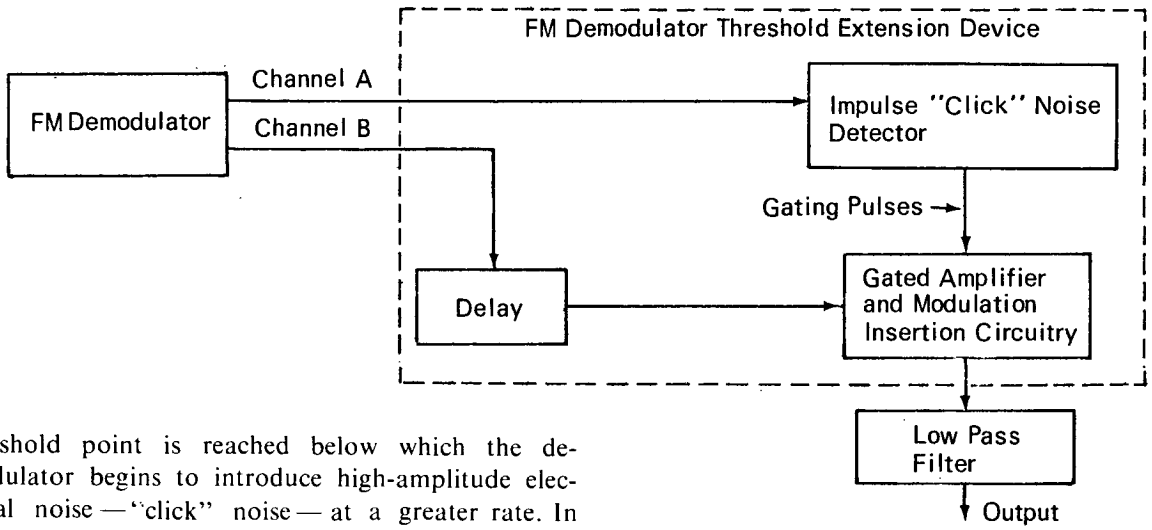

Figure 1.

(continued overleaf)

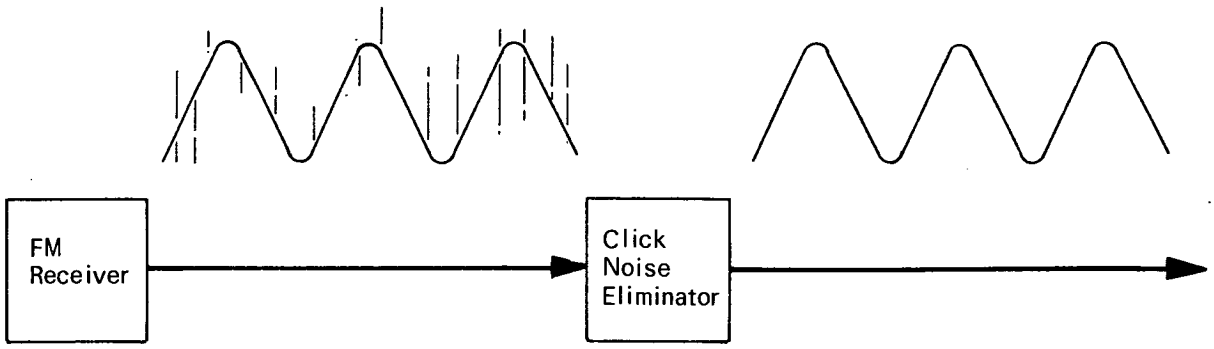

Figure 2.

B output which is smoothed over by additional circuitry. The output of the gating amplifier is fed to a low-pass filter for additional smoothing of the output modulation during the turn-off time. The apparent effectiveness of the threshold extension device is shown by the waveforms in Figure 2. The final output consists of signal plus low-level noise without the high amplitude impulses normally present.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Reference: TSP71-10091

Patent status:

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